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Power by Association℠

Edison Electric Institute

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Dear Mr. Chairman:

Thank you again for the opportunity to appear on Wednesday, August 24, 2015, before the Michigan Senate Energy and Technology Committee to discuss Senate Bill 438, revising Michigan's distributed generation pricing policies.

At that hearing, I mentioned a Brattle Group study that found that utility scale solar systems can produce electricity at half the cost of distributed solar systems and that utility scale solar can save 50% more carbon than distributed systems because they are more efficient. Senator Shirkey questioned the finding about greater efficiency. He also sought information to compare what utilities pay for utility scale solar with pricing options for distributed solar. This letter provides responses to both questions.

The Brattle Group study is entitled "Comparative Generation Costs of Utility-Scale and Residential-Scale PV in Xcel Energy Colorado's Service Area".
http://brattle.com/system/publications/pdfs/000/005/188/original/Comparative_Generation_Costs_of_Utility-Scale_and_Residential-Scale_PV_in_Xcel_Energy_Colorado%27s_Service_Area.pdf?1436797265

Briefly, the study examines the comparative customer-paid costs per solar MWh of generating electricity from equal amounts (300 MW) of utility- and residential-scale solar PV panels in Colorado. The study specifically assumed two utility scale plants would sell power to the utility under long term power purchase agreements and compared this to 60,000 distributed 5-kilowatt residential scale systems that were owned or leased by retail customers. Brattle Group Study at 5. **It concluded that "customer generation costs per solar MWh are estimated to be more than twice as high for residential-scale systems than the equivalent amount of utility-scale PV systems" for a reference case and five alternative scenarios** with varying investment tax credit, PV cost, inflation and financing parameters. Brattle Group Study at 1.

The purpose of using equal amounts of generation in the same locations was to simplify the comparison of costs and impacts. The Study finds that utility scale solar would produce 597,000 MWh annually, while residential scale PV would yield 400,000 MWh (p. 8, n6) with utility-scale solar saving from 6.6 cents/kWh to 9.2 cents/kWh across the scenarios. Id. at 7.

The lower costs for the utility-scale facility results principally from economies of scale for larger facilities and because the utility-scale plants are designed to optimize panel placement and use in order to achieve greater production and efficiency. Id. at 11. The authors believe that the "general relationship of the cost difference between the two types of PV systems is likely to hold true for most of, if not all, U.S. utilities with significant solar potential." Id. at 11.

The Brattle Group Study relies upon an EnerNex Study, (included in the attachment) which concluded that **the utility-scale system would have a capacity factor of 32%, twice as large as the 16% capacity factor for residential scale PV,** largely due to the use of a "single-axis

tracking" system. EnerNex Report (Production Levels of Utility-Scale and Residential-Scale PV Systems") at p.28. It also found that **even without tracking, the utility-scale system would still be produce 6% more capacity**. Id. Specifically, it found an average capacity factor (at 3 of 4 locations) of 16% for residential-scale PV, 22% for utility-scale PV without tracking and 29% for utility-scale PV with single-axis tracking. Id. at 22. As you know, systems with a higher capacity factor produce electricity more of the time.

These findings support my conclusions that utility-scale PV can be far more efficient at producing electricity than residential-scale and help explain why utility-scale systems can produce electricity at lower cost.

These conclusions are corroborated by a Department of Energy SunShot Initiative funded study conducted by the Lawrence Berkeley National Laboratory, entitled "Utility-Scale Solar 2013: An Empirical Analysis of Project, Cost, Performance, and Pricing Trends in the United States" (September 2014). http://emp.lbl.gov/sites/all/files/lbnl-6912e.pdf

The LBNL Study indicates that even though little utility-scale solar existed in the United States prior to 2007, by 2012 utility scale has become the largest sector of the overall domestic PV market and remained so in 2013. LBNL Executive Summary at i. **The LBNL Study reported the capacity weighted average cumulative capacity factor for these utility-scale units was 27.5%, somewhat below the level Brattle Group found for a utility-scale system with tracking.** Ex. Sum. at ii. However, the LBNL Study also found individual utility-scale capacity factors ranged from 16.6% to 32.8%. Id. Thus, the highest capacity factor reported by LBNL is consistent with those used by the Brattle Group for a new utility-scale system with tracking. According to LBNL:

> This variation is based on a number of factors, including (in approximate decreasing order of importance): the strength of the solar resource at the project site; whether the array is mounted at a fixed-tilt or on a tracking mechanism; the DC capacity of the array relative to the AC inverter rating (I.e., the inverter loading ratio), and the type of modules used (e.g., c-Si versus thin film). Id.

In short, these findings corroborate those of the Brattle Group in showing that utility-scale solar systems have higher capacity factors which makes them more productive and economical than residential-scale systems.

Finally, the LBNL Study does provide information about the prices utilities pay for utility-scale solar power. It reports that levelized purchased power agreement (PPA) prices had fallen dramatically by 2013 and that some of the most-recent PPAs in the southwestern United States are as low as or even lower than $50/MWh in 2013 dollars. Granted, there is far more sun in the Southwest than Michigan, but this price, which is equivalent to 5 cents/KWh is far below the net metering price of about 15 cents/KWh that Michigan utilities pay for solar power from distributed generation.

I hope this information is useful to you and the members of the Senate Energy and Technology Committee as you proceed with SB. No. 438.

Sincerely,

Edward Comer